

REMARKS/ARGUMENTS

Specification

The amendment to the co-pending applications paragraph on Page 1 is merely to update the application numbers to patent numbers. The Applicant submits that this amendment introduces no new matter.

In response to the Examiner's final Office Action of December 23, 2005 the Applicant respectfully submits the following Remarks.

The applicant appreciates the Examiner's continued indication of the allowability of the subject matter of pending claims 2-6 under the conditions stated in the Office Action. The Examiner's indication that claims 8-13 are allowed is also appreciated.

35 U.S.C. 102(e) Rejection

In the final Office Action, the Examiner has maintained the rejection of claim 1 over Khuri-Yakub and has provided reasons for this in the Response to Arguments section of the final Office Action. The Applicant respectfully disagrees with the Examiner's reasons and again submits that the subject matter of pending claim 1 is not disclosed by Khuri-Yakub for at least the reasons given in the Applicant's response to the first Office Action and the following further reasons.

The Examiner contends that the Applicant's argument that the annular piezoelectric actuator (17) of Khuri-Yakub operates quite differently than the claimed actuator because it functions to eject ink by oscillating at resonance, is not persuasive because the "essential detail" of the claimed actuator being "what kind of material the actuator is made of and what kind of actuator it is (i.e., piezoelectric, thermal)" is purportedly not claimed. The Applicant respectfully disagrees.

Pending claim 1 recites that the substrate of the inkjet printhead chip comprises a drive circuitry layer and nozzle arrangements. The nozzle arrangements include the claimed actuator which is recited as being displaceable towards the substrate upon receipt of an electrical current from the drive circuitry layer.

One of ordinary skill in the art understands that this recitation means that the claimed actuator therefore cannot be a piezoelectric actuator because, as described at page 14, lines 7-11 of the present specification, piezoelectric actuators must be connected to associated drive circuitry on a separate substrate.

This is the case in Khuri-Yakub where the conductive contact films 18 and 19, cited by the Examiner as purportedly providing a drive circuitry layer, are merely contacts of the piezoelectric disk 17 for connection to drive circuitry provided on a separate substrate. Thus, the kind of actuator claimed can be easily ascertained by one of ordinary skill in the art from the recitation of pending claim 1.

Further, pending claim 1 clearly recites the manner in which the claimed actuator operates. This is because it is recited that the actuator is displaced towards the substrate upon receipt of the electrical current from the drive circuitry layer, which reduces the nozzle chamber volume, and is displaced back to its original position upon cessation of the electrical current, which causes ink to be ejected from the ink ejection port.

Thus, it is clear to one of ordinary skill in the art from the recitation of claim 1 that it is the sequential activation and deactivation of the claimed actuator which causes ink to be ejected.

One of ordinary skill in the art clearly understands that this is different to the operation of a piezoelectric disk. This is because a piezoelectric disk is continuously driven by the associated drive circuitry to oscillate at resonance. This is the case in Khuri-Yakub where the piezoelectric disk 17 is continuously driven to oscillate membrane 13 about ink reservoir 14. It is this continuous driving, not activation and deactivation as claimed for the claimed actuator, which causes ink ejection in Khuri-Yakub.

Thus, contrary to the Examiner's contention, the "essential detail" of the claimed actuator as compared to the piezoelectric actuator of Khuri-Yakub is clearly recited in pending claim 1.

The Examiner also contends that the Applicant's argument that the claimed actuator's movements through activation and deactivation is not disclosed in Khuri-Yakub,

is not persuasive because Figs. 7C and 7D of Khuri-Yakub purportedly show the same movement of the piezoelectric disk (17). The Applicant respectfully disagrees.

The recited operation of the claimed actuator is clearly shown in Figs. 2 and 3 of the present application.

In Fig. 2, current is passed through the actuator 8,9 so that it is displaced towards the substrate. This decreases the volume in nozzle chamber 2 which causes a bulge in meniscus 3 to form at ejection port 4.

In Fig. 3, the current is stopped so that the actuator 8,9 returns to its original position. This causes necking and breaking of the meniscus 3 thereby ejecting drop 12 from the ejection port 4 (see page 10, lines 4-17 of the present specification).

Thus, as discussed above, it is clear to one of ordinary skill in the art from the recitation of claim 1 that it is the sequential activation and deactivation of the claimed actuator which causes ink to be ejected.

The operation of the piezoelectric disk 17 of Khuri-Yakub is clearly shown in Figs. 7A to 7D of Khuri-Yakub. Throughout the movements of the piezoelectric disk shown in Figs. 7A to 7D, the piezoelectric disk is being continuously driven, not activated and deactivated (see col. 2, line 61-col. 5, line 54 of Khuri-Yakub).

Thus, contrary to the Examiner's contention, in Fig. 7C of Khuri-Yakub, the piezoelectric disk 17 is being driven away from the substrate 11, not towards the substrate, which increases, not decreases, the volume in the reservoir 14 and causes an ink drop 27 to be ejected, and not a bulge in the meniscus.

Furthermore, contrary to the Examiner's contention, in Fig. 7D of Khuri-Yakub, the piezoelectric disk 17 is merely at the end of a cycle (see col. 3, lines 33-35 of Khuri-Yakub) and is therefore still being driven, not deactivated so as to return to its original position, which does not cause ink to be ejected since this has already occurred at the lowest position of the piezoelectric disk 17 as shown in Fig. 7C.

Thus, Khuri-Yakub does not disclose the subject matter of pending claim 1. Furthermore, there is no motivation from the disclosure of Khuri-Yakub to modify the piezoelectric disk to operate in the manner of the claimed actuator because the piezoelectric disk of Khuri-Yakub will only function to eject ink by being continuously driven to oscillate at resonance.

35 U.S.C. 103(a) Rejection

In the final Office Action, the Examiner has maintained the rejection of claim 7 over Khuri-Yakub in view of Asaba and has provided reasons for this in the Response to Arguments section of the final Office Action. The Applicant respectfully disagrees with the Examiner's reasons and again submits that the subject matter of pending claim 7 is not taught or suggested by Khuri-Yakub in view of Asaba for at least the reasons given in the Applicant's response to the first Office Action and the following further reasons.

The Examiner contends that the Applicant argued that the Asaba does not teach a CMOS drive circuitry layer. This is incorrect. The Applicant argued in the response to the first Office Action that Asaba does not make up for the deficiencies in Khuri-Yakub and as such any combination of Khuri-Yakub and Asaba does not teach or suggest the claimed invention.

Further, the Examiner contends that the combination of Khuri-Yakub and Asaba provides the CMOS drive circuitry layer of claim 7. The Applicant respectfully disagrees.

As discussed above, Khuri-Yakub uses a piezoelectric disk which one of ordinary skill in the art understands must be connected to associated drive circuitry on a separate substrate. That is, the conductive contact films 18 and 19 of Khuri-Yakub are merely contacts of the piezoelectric disk 17 for connection to drive circuitry provided on a separate substrate.

Thus, one skilled in the art understands that the CMOS circuit of Asaba which is provided on the same substrate as the transistors (see col. 1, line 36-col. 2, line 2 of Asaba) could not also be provided on the same substrate as a piezoelectric disk. Thus, the combination of Khuri-Yakub and Asaba does not teach or suggest the drive circuitry layer of the claimed invention.

Furthermore, since Asaba merely discloses actuators in the form of heat generating thin film resistors R_H which heat the ink to eject it from a recording head (see col. 5, lines 30-64 of Asaba), there is no disclosure in Asaba which would teach or suggest to one of ordinary skill in the art to replace the piezoelectric disk of Khuri-Yakub with an actuator which operates in the manner recited in the claimed invention.

Thus, any combination of Khuri-Yakub and Asaba does not teach or suggest the subject matter of pending claim 1, nor claim 7 dependent therefrom.

It is respectfully submitted that all of the Examiner's objections and rejections have been traversed. Accordingly, it is submitted that the present application is in condition for allowance and reconsideration of the present application is respectfully requested.

Very respectfully,

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